
CHAPTER SIX : LONG TERM INVESTMENT (CAPITAL BUDGETING) DECISIONS

Introduction

You have learnt in chapter one that one of the important functions of **financial management is investment decisions**. The success of a business unit depends upon the investment of resource in such a way that brings in benefits or best possible returns from any investment. Now, in this chapter, you will study the concept of **long term investment decisions involving fixed assets, or capital expenditures or capital budgeting**. Capital budgeting is the process of planning capital expenditures on assets whose **cash flows are expected to extend beyond one year**. In addition, you will learn techniques of evaluating and selecting profitable investment projects.

The Nature & meaning capital Budgeting decisions

Capital budgeting is the process of making investment in **capital expenditures**. A capital expenditure may be defined as an expenditure whose benefits are expected to be received over **period of more than one year**. In simple language, capital expenditure is an expenditure incurred for **acquired or improving the fixed assets**. The benefits of the fixed assets are expected to be received over a number of years in the future.

Capital budgeting is more or less a continuous process carried out by the several functional areas of corporate management. Marketing manager, production manager, engineering manager, and financial manager all play vital parts in shaping the capital budgets that are decided upon by the corporation. In addition, other departmental staffs make important, and at times, critical contributions to capital budgeting.

A Capital budget is a set of investment alternatives that have one common characteristic. This is the set of returns associated with an investment alternative that occurs over a period of two or more years. It is common, for

example, for proposed investments to exhibit expected economic lifetimes of 15 or even 20 years. Investments with such characteristics are called long term investments.

Capital budgeting is the process of making long-term investment decisions. It is the process of finding projects for a firm that will increase the value of the firm. More specifically, it is the process of **identifying, analyzing, and selecting** investment projects whose returns are expected to extend beyond one year. It involves the commitment of resources (large sum of money) for projects which have long-term consequences.

Capital Budgeting means a decision relating to planning for capital assets (e.g. purchase of a new machinery or setting of a factory) as to whether or not money should be invested in the long term projects. **Capital Budgeting** involves a financial analysis of the various alternative proposals regarding a capital expenditure and to select/choose the best out of the several alternatives. Capital Budgeting technique is employed to evaluate expenditure decisions which involve current outlays but are likely to produce benefits over a period of time usually exceeding one year. The term **Capital Budgeting** is used interchangeably with **capital expenditure** decisions making process for making investment decisions in capital expenditure or fixed assets

Capital budgeting process / Phases of capital budgeting

The entire capital budgeting process can be divided into following steps:

- 1) **Identification of potential investment opportunities**: the process of Capital budgeting begins with identifying potential investment opportunities. An individual or a planning committee is responsible for developing estimates of future sales, which form the basis for setting future production targets. Based on such information, estimates of

required investment can be made For imaginative identification of investment ideas it is helpful to

- ❖ monitor external environment (PEST analysis) regularly to scout investment opportunities
- ❖ formulate a well-defined corporate strategy based on a thorough analysis of strength weakness opportunities and threats
- ❖ share corporate strategy and perspective with persons who are involved in process of Capital budgeting
- ❖ motivate employees to make suggestions

2) **Assembling of investment proposals:** various investment proposals identified by departments of a company are submitted in a standardized capital investment proposal form. These proposals are routed through various persons in order to evaluate the capital investment decision from different angles. Projects can be classified as expansion replacement new product diversification or welfare projects.

3) **Decision Making:** the projects then undergo a preliminary screening to obtain those which merit further consideration. Different executives are vested with the authority to approve investment proposals to certain limits. For e.g. consider a manufacturing concern. The plant superintendent can approve investment outlays up to Br 2000,000. Any investment above the mentioned level needs the approval of the board of directors. Such a decision making process breaks up the investment approval process. Different appraisal criteria are used for the project selection such as payback, NPV etc.

4) **Preparation of capital budget and appropriations:** Projects involving smaller outlays, decided at the lower levels of the management are covered by a blanket appropriation. While those involving large cash outlays are included in the budget after getting necessary approvals. A proper appropriation of expenses ensures

adequacy of resources during implementation of the capital expenditure decisions.

5) **Implementation:** translating an investment decision into a concrete project is a time consuming process. Delay in implementation can lead to substantial cost and time overruns. To ensure proper implementation, the following points must be kept in mind:

- **Adequate formulation of projects-** this involves, conducting preliminary studies and a comprehensive and detailed formulation. It brings to light any difficulties likely to be faced in future. Therefore adequate formulation is necessary to ensure right implementation
- **Use of the principle of responsibility accounting-** assigning specific responsibilities to project managers for completing the project within the defined time frame and cost limit is helpful for the correct implementation of projects
- Use of network techniques- such as CPM, PERT, help easy implementation and monitoring of projects

6) **Performance review:** post completion audit is used as a feedback device. It compares the actual performance with the projected performance. Based on the review corrective steps can be taken. It is useful in following ways

- ❖ it throws light on how realistic were the assumptions underlying the project
- ❖ it provides a documented log of experience that is highly valuable for decision making
- ❖ it helps in uncovering judgment biases
- ❖ It includes a desired caution among project investors

Importance of Capital budgeting decisions

The terms in financial management like investment decisions, investment projects, and investment proposals are generally associated with application

of long-term resources. What is long-term? There is no hard and fast rule to define it, but by common practice and accordance with the financing policies, practices and regulations of the financial institutions and banks a period of ten years and above may be treated as long period. The decisions related to long-term investment is also known as capital budgeting techniques. The importance of capital budgeting can be well understood from the fact that an unsound investment decisions may prove to be fatal to the very existence of the firm. Capital budgeting decisions are important because of the following main reasons:

- ❖ **Large investments:** Capital budgeting decisions, generally, involve large investment of funds. But the funds available with the firm are always limited and the demand for funds far exceeds the resources. Hence, it is very important for a firm to plan and control its capital expenditures appropriately.
- ❖ **Critical for the company to succeed or fail:** The investment decisions are the vehicles of a company to reach the desired destiny of the company. An appropriate decision would yield spectacular results whereas a wrong decision may upset the whole financial plan and endanger the very survival of the firm. Even firm may be forced into bankruptcy.
- ❖ **Long-term effect on Profitability:** A capital expenditure decision has its effect over a long period of time span and inevitably affects the company's future cost.
- ❖ **Irreversible nature of capital budgeting decisions:** Capital budgeting techniques involve huge amounts of funds and imply permanent commitment. Once the decision for acquiring permanent assets is taken, it becomes very difficult to dispose of these assets without incurring heavy losses.
- ❖ **Investment decision is among the firm's most difficult decisions.** They are the predictors of future events which are difficult to predict. It is a complex problem investment. The cash flow

uncertainty is caused by economic, political, social and technological forces.

Types of CBDs/ Project & Components of Cash flows involved in CBDs

❖ Types of Capital Budgeting decisions/projects' classifications

Based on the investment alternatives and capital funds available, capital budgeting decisions are generally categorized into three as briefly discussed below:

- a) **Accept- reject decision**- this is the fundamental decision in capital budgeting. If the project is accepted then the firm invests in it, or else rejects it. **In general all projects which yield returns higher than the required rate of return (cost of capital in most cases) are accepted and the rest are rejected.** By these criteria all *independent* projects that satisfy the minimum investment criteria are accepted. *An independent Project* is a project whose cash flows are not affected by the accept-reject decision for the projects and the selection of one is not dependent on any other project
- b) **Mutually exclusive projects**: are set of projects from which at the most one will be accepted. They are set of projects which are to accomplish the same task. The acceptance of one excludes the acceptance of other projects. For e.g. deciding between a capital intensive or labor intensive machine. Thus when choosing between mutually exclusive projects more than one project may satisfy the Capital Budgeting criterion. However only one i.e. the best project can be accepted. *The best example is the outcome from tossing a coin (it can be either head or tail, not both)*
- c) **Capital rationing**: Capital rationing is a situation where a constraint or budget is placed on the total size of capital expenditures during a particular period. Often firms draw up their capital budget under the assumption that the availability of financial resources is limited. **Capital**

rationing refers to a situation where a company cannot take all acceptable projects it has identified because of shortage of capital. Under this situation a decision maker is compelled to reject some of the viable projects because of shortage of funds.

Some of the major factors leading to capital rationing are:

1. **External factors:** capital rationing may arise due to external factor such as **imperfection of capital market** or deficiencies in the market information, which may result in the unavailability of capital. Generally the market itself or the government will not supply unlimited amount of investment capital to company, even though the company has identified investment opportunities which would be able to produce the required return. Because of these imperfections the firm may not necessarily get amount of capital funds to carry out all profitable projects.
 2. **Internal factors:** capital rationing is also caused by internal factors which are as follows:
 - Reluctance to take resort to external finance in order to avoid further risk
 - Reluctance to broaden the equity share base for fear of losing control
 - Reluctance to accept some viable projects because of its inability to manage the firm in the scale of the operation.
- d) **Replacement decisions:** in case of Replacement decisions the implications are different. Developing cash flows for new projects or expansion projects is relatively straightforward. In such cases the initial investment, operating cash inflows and terminal cash inflow are the after tax cash flows associated with proposed projects. Estimating the relevant cash inflows for a replacement project is somewhat complicated because you have to determine the incremental cash inflow and outflow in

relation to existing project. The three components of the cash flow stream of a replacement project are determined as follows

- ❖ initial investment(cost of new assets+ net working capital required for the new asset)- (after tax salvage value realized from old asset+ net working capital required for the old asset)
- ❖ Operating cash inflows= operating cash inflow from new asset-cash inflow from old asset that has not been replaced.
- ❖ Terminal cash flow=(after tax salvage value of new asset+ recovery of net working capital associated with the new asset)-(after tax salvage value of old asset , it had not been replaced+ recovery of net working capital associated with the new asset)

Capital budgeting decisions can also be classified into two categories based on the benefits expected as follows:

1. Cost Reduction Projects

- ❖ Are intended to reduce the operating costs such as cost of materials, cost of labor, and the like.
- ❖ Are usually replacement decisions i.e Replacement of worn-out and damaged fixed assets and Replacement of obsolete fixed assets
- ❖ The benefits from cost reduction projects are in the form of cost saving rather than direct cash inflow

2. Revenue Expansion Projects: A company adds capacity to its existing product lines to expand existing operations. These are intended to increase revenues and the benefit is measured in terms of cash flows

Components of cash flows involved in Capital budgeting Decisions

Investment cash flows are generally classified in to three components as follows

1. Initial (net) investments

2. Operating cash flows
3. Terminal cash flows

Initial Investment

- ❖ Initial investment (I_o) refers to outlay of cash that takes place at the beginning of the life of the project.
- ❖ Initial investment of revenue expansion projects usually includes gross investment, increase in networking capital, and investment tax credits
- ❖ The main components of initial investment are:
 - a) **Gross Investment.** It is the investment's purchase price and other incidental costs like transportation charges, insurance, taxes, broker's commission, installation costs, customs duty, etc. It is the base for computation of depreciation
 - b) **Increase in Net Working Capital (NWC).** $NWC = \text{Current Assets} - \text{Current Liabilities}$. Increase in NWC is the difference between increase in current assets and increase in current liabilities. Increases initial cash outlays
 - c) **Salvage proceeds from sale of old asset.** It occurs only in replacement decisions. Decreases initial cash outlays
 - d) **Tax increase, or tax saving (or tax shield).** It occurs in replacement decisions. Tax increase occurs if old asset is sold above its book value, and increases initial investment. Tax saving occurs if old asset is sold below its book value, and decreases initial investment
 - e) **Investment tax credit.** It is a specified percentage of the dollar amount of new investment and applied on gross investment. The purpose is to provide an incentive for new investment

Thus, $I_o = a + b - c$ $\pm d - e$
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Terminal Cash Flows

Terminal cash flows are those cash flows which are expected to occur at the end of the life of the project. These include salvage value of new investment (net of income tax) and recovery in net working capital

Net Operating Cash Inflows

These are cash flows expected (estimated) to occur during the project's life during which the project is in operation. There are two approaches in estimating project Net Cash Flows (NCF)

1. Income Approach

$NCF = \text{Net Income} + \text{Non-cash Expenses}$ or $NCF = \text{Net Income} + \text{Depreciation}$
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2. Decomposition Approach

After-Tax Cash Revenue	XXX
Deduct: After-Tax Cash Expenses	XXX
	XXX
Add: Tax Saving on Depreciation	XXX
NCF	XXX

- ❖ After Tax Cash Revenue = Cash Revenue (1- Tax rate)
- ❖ After-Tax Cash Expenses = Cash expenses (1 - Tax rate)
- ❖ Tax saving on depreciation = Depreciation X Tax rate

Capital Budgeting /Investment

Evaluation/Appraisal

There are several methods of long term investment (project) evaluation & appraisal. They are broadly categorized into traditional [non-Discounted cash flow (DCF)] and Discounted Cash Flow techniques

Traditional vs DCF: the following are the distinguishing features between traditional and DCF techniques

1. Traditional methods are easy to understand as they do not involve many calculations. DCF methods involve many formulae and tedious calculations. And it is also not very easy to understand by layman
2. Traditional methods are not time consuming as they do not involve many calculations. DCF techniques consume more time due to the calculations
3. Traditional methods fail to consider time value of money. DCF methods considers time value of money and accordingly fixes capital budget
4. Traditional methods (specifically Payback period method) ignores cash flow beyond payback period whereas DCF methods takes into account all the years even after the payback period which makes DCF method more reliable
5. Traditional method measures projects capital recovery whereas DCF method measures capital recovery, cash flows profitability
6. Traditional methods stresses upon liquidity whereas DCF stresses on maximization of shareholders wealth.

Traditional(Non- DCF)	Discounted Cash Flow
Payback ARR	Discounted Payback NPV Profitability Index/ BCR IRR

Note: The Ideal Evaluation Method should:

- include all net cash flows that occur during the life of the project,
- consider the time value of money,
- Incorporate the required rate of return on the project.

Traditional (Non-discounted Cash flow) techniques

1. Accounting Rate of Return (ARR)

Accounting rate of return (also known as average rate of return) method employs the normal accounting technique to measure the increase in profit expected to result from an investment by expressing the net accounting profit arising from the investment as a % of that capital investment. Accounting rate of return is a rate computed by dividing a project's expected average net income by the average investment. Average investment is computed as follows:

$$\text{Average investment} = \frac{\text{original investment} + \text{salvage value}}{2}$$

Or, for Revenue expansion decisions, Average investment can be computed using the following formula:

$$\text{Average investment} = \text{Networking capital} + \text{salvage value} + \frac{1}{2} (\text{cost of plant assets} - \text{salvage value})$$

$$\text{Average profits} = \frac{\text{Total of annual profits}}{\text{Number of years}}$$

$$\text{ARR} = \frac{\text{average profit after tax}}{\text{average book value of investment}} \times 100$$

Sometimes initial investment is used in place of average investment.

Decision Rule:

- Accept the project if Accounting Rate of Return is equal to or greater than the standard set by the management.
- Reject the project if Accounting Rate of Return is less than the standard set by the management.

That means, of the various Accounting rates of returns with different alternative proposals, the one having highest rate of return is taken to be the best investment proposal. For e.g. assume three alternative proposals: A, B, and C with Average rate of return of 10%, 20%, and 18%, respectively. From these projects, the selection will be in the order of B, C and A. But if the minimum of return to set by the management be 15%, only proposals B and C will qualify for consideration in that order.

Therefore, accounting rate of return is the average rate of profitability. The ARR of the project is compared with the ARR of the firm as a whole or against some external yard stick like the average rate of return of the industry as a whole. Even though it is not widely used it does have some merits. The following are among the advantages of ARR method

- It is simple both in concept & application
- It expresses returns in a % which is easy for businessmen to understand
- Information requires for calculation is easily available in the books of accounts
- Considers the entire life of the project

It suffers from the following shortcomings:

- It fails to consider time value of money
- Considers profits and not cash flows
- Does not maximize shareholder wealth

2. Payback Period (Non Discounted)

This is one of the widely used methods for evaluating the investment proposals. Under this method the focus is on the recovery of original investment at the earliest possible. It determines the number of years to recoup the original cash out flow, disregarding the salvage value and interest. In other words, it answer the question like “How long will it take for the project to generate enough cash to pay for itself?”

Computation of the Payback Period: There are two methods in use to calculate the payback period. 1) Where the annual cash flow is uniform 2) Where annual cash flows are not consistent vary from year to year

- i. If the expected cash flows are all the same, then

$$PBP = \frac{\text{Initial Investment}}{\text{Annual NCF}}$$

- ii. If the net cash flows are not all the same, you simply sum the cash flows until the total equals or exceeds the cost of the project. You can use interpolation to narrow the result down to the desired level of accuracy.

$$PBP = \text{Year before full recovery} + \frac{\text{Unrecovered cost at start of year}}{\text{Net cash flow during the year}}$$

$$\frac{B}{C}$$

$$\text{Or, } P = E +$$

Where, P stands for payback period.

E stands for number of years immediately preceding the year of final recovery.

B stands for the balance amount still to be recovered.

C stands for cash flow during the year of final recovery.

Decision Rule:

Payback period measures the length of time required to recover the initial outlay in the project. Therefore, to be accepted, the project's payback period should be less than or equal to the standard (cut off) set by the management.

For mutually exclusive projects, the project with a smaller payback period is accepted provided that its payback period is less than the firm's cut-off. Mutually exclusive (dependent) projects are projects in which the acceptance of one rejects the other. For independent projects, accept all projects whose payback period is less than the firm's cut-off rate .

Advantages of payback period

It is widely used for the following reasons

- ❖ It is simple both in concept & application
- ❖ It helps in minimizing risk by favoring only those projects which generate substantial inflows in earlier year
- ❖ Emphasis on liquidity

Disadvantages of Payback period method as project evaluation technique

It suffers from the following shortcomings:

- ❖ It fails to consider time value of money.
- ❖ The cut off period is chosen rather arbitrarily & applied uniformly for evaluating projects regardless of their life span
- ❖ Ignores cash flows beyond the payback period
- ❖ Measures capital recovery but not profitability

Discounted Payback Period

- ❖ Discounts the cash flows at the firm's required rate of return.
- ❖ Payback period is calculated using these discounted net cash flows

Discounted Cash Flow (DCF) Techniques

This concept is based on the time value of money. The flow of income is spread over a few years. The real value of Birr in your hand today is better than value of birr you earn after a year. The future income, therefore, has to

be discounted in order to be associated with the current out flow of funds in the investment. DCF techniques generally have the following characteristics:

- ❖ Examine all net cash flows
- ❖ Consider the time value of money
- ❖ Consider the required rate of return

The major DCF techniques are:

1. Net Present Value method
2. Profitability Index
3. Internal Rate of Return

Net Present Value (NPV) method

Net Present Value is equal to the difference between the Present Value of the future cash inflows usually discounted at the rate of cost of capital & any immediate cash outflow. A project will be accepted if its NPV is positive & rejected if it is negative. Rarely in real life are situations of projects with NPV exactly equal to zero. NPV takes in to account the time value of money & considers the cash flow stream in its entirety. Since NPV represents the contribution to the wealth of the shareholders maximizing NPV is congruent with the objective of investment decision making viz. maximization of shareholder wealth

$$\text{NPV} = \text{Total PV of NCF} - \text{Initial Investment}$$

$$\text{NPV} = \sum_{n=1}^n \frac{\text{NCF}}{(1+i)^n} - I_o$$

Where,

I_o = Initial investment

n = useful life of the project

i = required rate of return

NCF = Net cash flows

Merits (Advantages)

- It is based on the assumptions that cash flows determine the shareholders' value as cash flows are subjective than profits
- It recognizes time value of money
- Considers the total benefits arising out of proposal over its life time
- This method is particularly useful for the selection of mutually exclusive projects
- This method of project selection is instrumental in achieving the financial objective i.e. maximization of shareholders wealth.

Demerits (Disadvantages)

- It is difficult to understand as well as calculate it as compared to ARR or payback period method
- Calculation of the desired rates of returns presents serious problems. Generally cost of capital is the basis of determining the desired rate. Calculation of cost of capital is itself complicated. More ever desired rate of return will vary from year to year
- This method emphasizes the comparison of NPV and disregards the initial investment involved. Thus this method may not give dependable results
- The project may not give satisfactory results when two projects having different effective lives are being compared.

Decision Rule

- Accept the project if NPV is positive
- Reject the project if NPV is negative
- For mutually exclusive projects, the project with the highest positive NPV is accepted
- For independent projects, all projects with positive NPV are accepted. Projects are said to be independent if the acceptance of one does not result in rejection of the other.

Profitability Index (PI)/Benefit-to-Cost Ratio (BCR)

This method measures the relationship between the present values of the future cash inflows usually discounted at the rate of cost of capital any

immediate cash outflow Profitability index is the ratio of the total present value of net cash flows and the project's initial investment. It simply converts the NPV criterion in to a relative measure.

$$PI = \frac{\text{Total present value of NCF}}{\text{Initial Investment}}$$

Decision Rule:

- Accept the project if its profitability index is greater than one
- Reject the project if its profitability index is less than one

Note: If the project's profitability index is equal to 1, its NPV is equal to 0, and vice versa.

Since the PI/BCR measures the present value per Birr of outlay it is considered to be useful criterion for ranking a set of projects in order of decreasingly efficient use of capital. But it has some limitations like it provides no means of aggregating several smaller projects into package that can be compared with a large project. Second, when the investment outlay is spread over more than one period, this criterion cannot be used

Internal Rate of Return (IRR)

Internal rate of return is that rate of interest at which the NPV of a project is equal to zero or the rate which equates the present value of the cash outflows to the present value of the cash inflows. While under NPV method the rate of discounting is known under IRR method this rate which makes the NPV zero has to be found out.

The internal rate of return is also known as yield on investment, marginal efficiency of capital, marginal productivity of capital, time adjusted rate of return and so on. Internal rate of return is nothing but the rate of interest which equates the present value of future earnings with the present value of present investment. Therefore, IRR depends entirely on the initial outlay and the cash proceeds of the project which is being evaluated for

acceptance or rejection. The computation of IRR is difficult one; you have to start equating the two values i.e., present value of future earnings and present value of investment. It is possible through trial and error method.

Computation of IRR

IRR can be calculated basing on the payback period where annual cash flows are uniform, in case the annual cash inflows are different for the periods, the fake payback period is calculated and then trial and error procedure will be adopted. So the computation of IRR varies depending on the nature of cash flow streams.

i) Determining IRR when Net Cash flows are Uniform

The following steps can be used to determine IRR:

Step 1: Compute the leading discount factor or Payback period

$$\text{LDF} = \frac{\text{Initial Investment}}{\text{Annual NCF}}$$

Step 2: Locate the IRR by looking along the appropriate period (n) in the present value of an annuity table until the column which includes the leading discount factor is reached. The discount rate of this column is the IRR for the project.

Decision Rule:

- Accept the project if the IRR is greater than the required rate of return.
- Reject the project if its IRR is less than the required rate of return

What if the leading discount factor is not exactly found the present value of an annuity table? The following steps can be used to determine IRR:

Step 1: Compute the leading discount factor or Payback period

$$LDF = \frac{\text{Initial Investment}}{\text{Annual NCF}}$$

Step 2: Locate the IRR by looking along the appropriate period (n) in the present value of an annuity table until the column which includes the leading discount factor is reached. The discount rate of this column is the IRR for the project.

Step 3: If the leading discount factor is not found in the year the present value of an annuity table, take two discount factors closest to the leading discount factor but one bigger and the both smaller than it.

Step 4: Determine the exact IRR using the following formula:

$$IRR = r - \left(\frac{PBP - DFr}{DFr_L - DFr_H} \right)$$

Where,

r = the taken discount rate (either smaller rate or larger rate)

PBP = Payback period or leading discount factor

DFr = Discount factor of r

DFr_L = Discount factor of the lower rate

DFr_H = Discount factor of the higher rate

ii) Determining IRR When Net Cash Flows are not uniform

Example: Assume that the project requires initial investment of Br. 350,000. Annual net cash flows are expected to be as follows:

Year 1	Br 60,000	Year 4	Br 80,000
Year 2	Br 70,000	Year 5	Br 100,000
Year 3	Br 90,000	Year 6	Br 120,000

If the required rate of return is 10%, what is IRR?

Solution

Step 1: Compute weighted average net cash flows

<i>Year</i>	NCF	Weight	NCF x Weight
1	60,000	6	360,000
2	70,000	5	350,000
3	90,000	4	360,000
4	80,000	3	240,000
5	100,000	2	200,000
6	120,000	1	120,000
		21	1,630,000

The life of the project is assigned in the reverse order to get the weight for each NCF.

$$\text{Weighted average NCF} = \frac{1,630,000}{21} = 77,619$$

Step 2: Determine leading discount factor using weighted average NCF

$$\text{PBP (LDF)} = \frac{350,000}{77,619} = 4.509$$

Step 3: Locate the IRR by looking along the appropriate period (n) in the present value of an annuity table until the column which includes the leading discount factor is reached. If you do not find the exact discount rate, you take the nearest discount rate to be used as the first guess. In the example under consideration, the nearest rate is 9% (First guess = 9%).

Step 4: Compute NPV at the discount rate identified in step 3 above

Year	NCF (2)	Discount factor at 9% (3)	Present Value (4) = (2) X (3)
1	60,000	0.917	55,020
2	70,000	0.842	58,940
3	90,000	0.772	69,480
4	80,000	0.708	56,640
5	100,000	0.650	65,000
6	120,000	0.596	71,520

TOTAL PRESENT VALUE OF NCF	376,600
DEDUCT: INITIAL INVESTMENT	350,000
NPV	26,600

If NPV is not equal to zero at 9% (first-guess), another rate should be tried. If NPV is positive, try a higher rate. On the other hand, if NPV is negative, try a lower rate. Since NPV is positive at 9%, we need to try a higher rate. Let say, the second guess is 11%. NPV at 11% is computed as follows:

Year	NCF (2)	Discount factor at 11% (3)	Present Value (4) = (2) X (3)
1	60,000	0.901	54,060
2	70,000	0.812	56,840
3	90,000	0.731	65,790
4	80,000	0.659	52,720
5	100,000	0.593	59,300
6	120,000	0.535	64,200
TOTAL PRESENT VALUE OF NCF			352,910
DEDUCT: INITIAL INVESTMENT			350,000
NPV			2910

Since NPV is positive, a higher rate should be tried.

Third guess = 12%

Year	NCF (2)	Discount factor at 12% (3)	Present Value (4) = (2) X (3)
1	60,000	0.893	53,580
2	70,000	0.797	55,790
3	90,000	0.712	64,080
4	80,000	0.636	50,880
5	100,000	0.567	56,700
6	120,000	0.507	60,840

TOTAL PRESENT VALUE OF NCF	341,870
DEDUCT: INITIAL INVESTMENT	350,000
NPV	(8130)

At 12%, NPV is negative indicating that IRR lies between 11% and 12%.

To determine the exact IRR, interpolation method can be used:

1. Obtain the absolute sum of NPVs of the two rates

$$= /2910/ + /-8130/$$

$$= 11,040$$

2. Divide NPV of the smaller rate by the absolute sum and add the result to the smaller rate.

$$\frac{2910}{11,040} = 0.26$$

$$= 0.0026$$

$$\text{Thus, IRR} = 11\% + 0.0026 = \mathbf{11.26\%}$$

Merits (Advantages)

- It recognizes time value of money. It takes into account the total cash inflows and cash outflows
- It is easy to understand by executives and non-technical personnel. For e.g. The business executive will understand the investment proposal in a better way if it is told that IRR of an investment is 20%
- It does not involve the concept of desired rate of return whereas it provides the rate of return which is indicative of profitability of investment proposal

Demerits (Disadvantages)

- It involves tedious calculations based on trial and error method
- IRR is uniquely defined only for a project whose cash flow pattern is characterized by cash outflows followed by cash inflows. If the cash stream has one or more cash outflows interspersed with cash inflows there can be multiple rate of returns

- The IRR criterion can be misleading when the decision maker has to choose between mutually exclusive projects that differ significantly in terms of outlays

Multinational (International) Capital Budgeting

☞ Subsidiary versus Parent Perspective

- Should the capital budgeting for a multinational project be conducted from the viewpoint of the subsidiary that will administer the project, or the parent that will finance the project?
- The results can vary with the perspective taken because the net after-tax cash inflows to the parent can differ substantially from those to the subsidiary.
- Net cash flow differences can be due to:
 - o Tax differentials
 - o Tax rate on remitted funds
 - o Regulations that restrict remittances
 - o Minimizing remittance payments
 - o The parent may charge its subsidiary high administrative fees.
 - o • Exchange rate movements
- A parent's perspective is appropriate when evaluating a project, since any project that can create a positive net present value for the parent should enhance the firm's value.
- However, one exception to this rule occurs when the foreign subsidiary is not wholly owned by the parent.

Factors to Consider in Multinational Capital Budgeting

- 1. Exchange rate fluctuations:** Since it is difficult to accurately forecast exchange rates, different scenarios can be considered together with their probability of occurrence.

2. **Inflation:** Although price/cost forecasting implicitly considers inflation, inflation can be quite volatile from year to year for some countries.
3. **Financing arrangement:** Financing costs are usually captured by the discount rate. However, when foreign projects are partially financed by foreign subsidiaries, a more accurate approach is to separate the subsidiary investment and explicitly consider foreign loan payments as cash outflows.
4. **Blocked funds:** Some countries require that the earnings generated by the subsidiary be reinvested locally for at least a certain period of time before they can be remitted to the parent. But, why?
5. **Uncertain salvage value:** Since the salvage value typically has a significant impact on the project's NPV, the MNC may want to compute the break-even salvage value.
6. **Impact of project on prevailing cash flows:** The new investment may compete with the existing business for the same customers.
7. **Host government incentives:** These should also be incorporated into the analysis.
8. **Real options:** Some projects contain real options for additional business opportunities. The value of such a real option depends on the probability of exercising the option and the resulting NPV.

Adjusting Project Assessment for Risk

When MNCs are unsure of the estimated cash flows of a proposed project, they need to incorporate an adjustment for this risk.

- ☞ One method is to use a **risk-adjusted discount rate**. The greater the uncertainty, the larger the risk-adjusted discount rate that should be applied to the cash flows.
- ☞ MNCs may also perform **sensitivity analysis** or **simulation** using computer software packages for their evaluation. **Sensitivity analysis** involves considering alternative estimates for the input

variables, while simulation involves repeating the analysis many times using input values randomly drawn from their respective probability distributions.